Buildings Sector

The design, construction, and maintenance of our nation's buildings significantly impact the economy and environment. There are more than 76 million residential buildings and nearly 5 million commercial buildings in the United States today. All together, these buildings account for two-thirds of all U.S. electricity consumption and 36% of total U.S. energy consumption. Residential and commercial buildings cost the nation $240 billion per year to operate. The operation of these buildings also contributes significantly to greenhouse gases and air pollution. By the year 2010, another 38 million buildings will be constructed across the nation. These considerable statistics underscore the buildings sector's pivotal role in the campaign to spread energy efficiency and renewable energy practices.

SEP SPECIAL PROJECTS FUNDING IN THE BUILDINGS SECTOR:	
1996	$6,497,000
1997	$4,861,000
1998	$5,185,863
1999	$7,475,402
total:	$24 million

Across the country, there has been a growing trend towards energy-efficient building construction both in the residential and commercial sectors. Today's homes are, on average, 35% more efficient than those built 20 years ago. Buildings which incorporate energy-efficient technologies are typically more comfortable, have lower energy costs, and a reduced environmental impact. Installation of simple retrofits in existing homes and buildings could reduce energy consumption by 20% to 30%.

ENERGY-EFFICIENT CONSTRUCTION OF RESIDENTIAL BUILDINGS IS A GROWING TREND IN COMMUNITIES ACROSS THE NATION. THE INCORPORATION OF ENERGY-EFFICIENT BUILDING TECHNIQUES CAN RESULT IN A SIGNIFICANT DECLINE IN THE NATION'S ENERGY CONSUMPTION.

MANY CODES AND STANDARDS SPECIAL PROJECTS RELY ON CLASSROOM TRAINING AS AN INTEGRAL COMPONENT OF ENERGY CODE COMPLIANCE. IN CONJUNCTION WITH THESE CLASSES, ON-SITE TRAINING PROVIDES BUILDERS WITH PRACTICAL, HANDS-ON ENERGY EDUCATION.

Through SEP Special Projects grants, the Office of Building Technology, State and Community Programs (BTS) supports projects which address the creation, expansion, and enforcement of national, regional, and statewide codes and standards in new building construction, as well as projects which promote the conversion and modification of older buildings to incorporate energy efficiency and renewable energy technologies.

CODES AND STANDARDS

Through Codes and Standards Special Projects, States are encouraged to establish comprehensive energy codes. Special Projects also assist States which have existing energy codes but need additional support to expand or enhance their codes to meet or exceed the 1993 Model Energy Code (MEC) and ASHRAE/IES Standard 90.1 (1989). Through various Codes and Standards projects, BTS is able to directly assist States in reducing energy consumption in residential and commercial buildings and minimize environmental impacts.

Through the ***Codes and Standards Special Project***, the State of **Louisiana** drafted legislation for a statewide energy code for commercial buildings, which the legislature subsequently adopted. The project offered free training, compliance materials, and ongoing education to the State's commercial builders. In the first year alone, over 1,000 new commercial buildings passed compliance regulations, as approved by the Fire Marshall. Louisiana estimates that the

Today's homes are, on average, 35% more efficient than those built 20 years ago.

compliant buildings will realize utility bill savings of $4 million annually and energy savings of 323 billion Btu.

There is burgeoning support for energy codes in the U.S. Territories, as well. In **Puerto Rico**, the *Building Technology Codes and Standards Project* developed the island's first energy code. The code set minimum requirements for the design of new residential and commercial buildings. While Puerto Rico's code was based on existing energy codes, adaptations were made for the island's unique climate and construction methods.

Special Projects also assist States in updating their codes to reflect code modifications and updates on the national level. The *Northeast Regional Building Codes Energy Project* is a collaboration between **Connecticut, Delaware, Washington, D.C., Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island,** and **Vermont**. These partners recognized that their outdated energy codes were resulting in lost energy-saving opportunities for buildings in each State. In addition to energy code upgrades, the partnership offers support for code implementation and provides energy code training to building professionals. The program also encourages utility participation in the form of financing and public education. In New York State alone it was determined that an upgrade to the existing energy code would result in $3.5 million in annual energy savings.

ONCE DESIGNERS AND BUILDERS HAVE ATTENDED ENERGY CODE TRAINING, THEY CAN EASILY INCORPORATE THESE METHODOLOGIES INTO THEIR WORK.

In Hawaii, the Advanced Technologies Training Program has created a mobile display unit to provide accessible energy efficiency training to the building industry.

One of the most important aspects of energy code compliance is the education of the building community, including designers, architects, inspectors, building managers, construction personnel, and contractors. The States of **California** and **Nevada** have partnered with the Building Industry Institute to create one of the most effective Codes and Standards projects in terms of market penetration, entitled ***Builder Training on Energy Codes.*** Aimed at builders, the program involves a half-day of classroom training in energy codes and a half-day of on-site inspections, with a six-month follow-up session. In just over three years, the program has trained 253 large production builders. Since the training, these builders have constructed 63,000 homes, resulting in an estimated energy savings of $1.2 million dollars annually for the compliant new homes.

In **Hawaii** the *Advanced Building Technologies Training Program* has successfully disseminated information on advanced techniques to both the building industry and the general public. In addition to holding workshops, the program created five mobile display modules and distributed resource guides. *Codes and Standards* in **Iowa** also created workshops to educate the building community of code requirements and updates. In addition, the project also developed an effective and simplified way for builders to comply with the State's energy code, including Iowa-specific residential and commercial energy code toolkits, Iowa-specific checklists for code compliance, and a "how-to" manual on cost-effective, energy-efficient construction techniques. The program was supported by $125,000 in Special Projects funds and the State was able to raise a significant $86,000 in leveraged funds.

Since attending Codes and Standards training in California and Nevada, builders have constructed 63,000 homes, resulting in an estimated energy savings of $1.2 million annually for compliant homes.

BUILDINGS SECTOR

Residential and commercial buildings cost the nation $240 billion per year to operate.

THE THOROUGH INSPECTION OF WATER HEATERS AND OTHER MAJOR APPLIANCES IS CRUCIAL IN DETERMINING WHICH ENERGY-EFFICIENT ADJUSTMENTS ARE REQUIRED IN NEW AND EXISTING BUILDINGS.

Ohio's ***Codes and Standards Project*** employed a multi-faceted approach to encourage code compliance. The project provided 26 sessions of Model Energy Code training and conducted 17 other sessions on energy-efficient lighting and energy-efficient construction, reaching a total of 400 members of the building community. **Wisconsin's** ***Comprehensive Approach to Energy Codes Project*** has offered a myriad of educational services, as well. The project held workshops to educate over 1,350 builders, subcontractors, and designers on the Uniform Dwelling Code and offered on-site compliance training for the code.

Some Codes and Standards projects focus on increasing compliance by creating better energy efficiency software programs. The ***HiLight Software Program*** in **Hawaii** has been extremely successful in educating architects, engineers, and building codes officials about the lighting portion of the Model Energy Code. Hawaii created an integrated software program that allows the user to input the building's lighting specifications, and then determines whether the building is compliant or suggests the proper changes. Lighting is especially important in tropical climates, as the commercial buildings are air-conditioned twelve months a year and lighting systems can be a significant source of heat. Through proper code compliance, both the electricity and air-conditioning expenses can be lessened considerably. To date, this project's software and training have been utilized by American Samoa, Guam, Wisconsin, Puerto Rico, Washington, D.C., Oregon, and the Federal Energy Management Program (FEMP).

Several States have modernized their State's computerized energy code compliance systems through SEP Special Projects. In **Florida,** the ***Codes and Standards Project*** created a partnership between the Florida Energy Office and the Florida Solar Energy Center which upgraded the energy efficiency analysis software to a windows-based interface in response to user suggestions.

Some States have acquired a more hands-on approach to code compliance through the employment of a circuit rider. In **Oregon**, the ***Non-Residential Energy Code Circuit Rider*** is a full-time position. The Circuit Rider travels to construction sites across the State to offer on-site technical assistance.

As energy-efficient construction can sometimes incur slightly higher costs at the outset, financing can be an impediment. In **Nebraska**, the ***Financing Incentives for Increased Energy Efficiency in Nebraska Program*** was established to mitigate this problem. The project enables private lenders to offer low-cost loans to cover the incremental costs of construction in units that reduce energy consumption by 30%. The State was able to supplement the $400,000 Federal grant by leveraging $405,000 in private funds. This seed money is kept in a revolving account in order to continue providing low-cost financing to builders. In addition, the designers and builders are educated as to which energy efficiency features are most affordable.

The **Maryland** *Energy Codes and Building Standards Project* focused on advanced education for building professionals and local code officials. In order to provide easier compliance to the Council of American Building Officials Energy Code, the project created a software tool for use by local code officials at the plan review and inspection phases. Additionally, the project strives to make other educational opportunities a viable option by offering "scholarships" to code officials to attend conference training on various technical subjects.

Rebuild Iowa has implemented $130 million in retrofits, resulting in $23 million annual energy cost savings.

REBUILD IDAHO HAS PERFORMED RETROFITS IN BUILDINGS ACROSS THE STATE, FOCUSING ON EDUCATIONAL FACILITIES SUCH AS THIS RURAL IDAHO ELEMENTARY SCHOOL.

REBUILD AMERICA

One of the most broadly-based BTS programs is Rebuild America. Rebuild America is a nationwide initiative that helps communities save money, create jobs, and protect the environment through implementation of energy-efficient retrofits in existing commercial buildings and multi-family housing units. With 250 partnerships in 47 States, Native American Tribes, and in three U.S. Territories, the program is well on it way to reaching its goal of completing energy efficiency retrofits in 2 billion square feet of floor space by 2003. If this goal is achieved, the United States will save $650 million dollars in energy costs each year and reduce air pollution by 1.6 million tons of carbon dioxide annually. ***Rebuild Utah*** is an outstanding example of the breadth and diversity of the program. The program has performed retrofits in 24 buildings of the University of **Utah** campus, which will save the school $1.86 million per year in energy costs.

Partnerships are key to making Rebuild America projects work. ***Rebuild Idaho*** consists of eleven partners, including two universities, one college, two utilities, three school districts, and five communities. The Rebuild Idaho partnership aims not only to provide cost-saving retrofits, but to establish itself as the foremost program to assist **Idaho's** communities, school districts, businesses, and industries in developing sustainable, long-term energy and resource efficiency strategies.

Rebuild Iowa is a collaborative effort that brings together diverse public and private sector organizations to make cost-effective, energy efficiency improvements in existing buildings. Since the inception of the program, more than $130 million in retrofits have been implemented, resulting in $23 million annual energy cost savings for **Iowa's** school districts, local governments, hospitals,

Location	Estimated Annual Energy Cost Savings
University of Hawaii at Hilo	$465,000
County of Hawaii	$61,000
County of Kauai	$35,000

REBUILD HAWAII PARTNERSHIPS HAVE BEEN PARTICULARLY ACTIVE ACROSS THE STATE, RESULTING IN SUBSTANTIAL ANNUAL ENERGY SAVINGS.

and private colleges. The financing for these improvements has been supported by more than $800,000 in privately-leveraged funds.

Providing another example of effective partnerships and exceptional leveraging efforts, ***Rebuild Hawaii*** is comprised of a consortium of more than 20 partners including utility providers, private companies, universities, and Federal, State, and local governments.

Using $313,000 in SEP Special Projects funds as seed money, local organizations donated a total of more than $3.0 million. Rebuild Hawaii's mission is to identify and leverage statewide resources, create community awareness, and find additional support for energy efficiency projects. Performance contracts have been implemented at sites across **Hawaii**, identifying significant energy savings.

Rebuild Utah has performed retrofits in 24 buildings at the University of Utah campus, which will save the school $1.86 million per year in energy costs.

THE REBUILD HAWAII PROJECT PROVIDED FOR THE INSTALLATION OF A 400-TON VARIABLE SPEED CENTRIFUGAL CHILLER AT THE UNIVERSITY OF HAWAII.